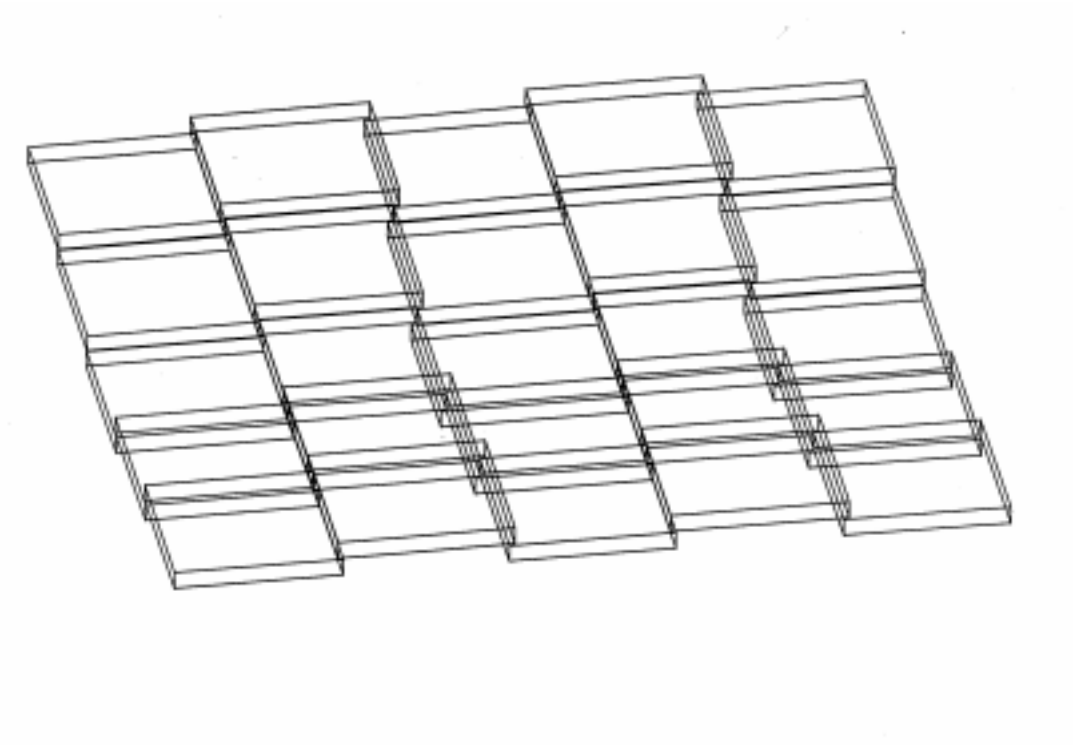
ACD transparency

- gaps between tiles
- holes in tile to attach them
- vertical clearances between tiles
- sealing fiber tapes to cover gaps between tiles
- tile overlaps

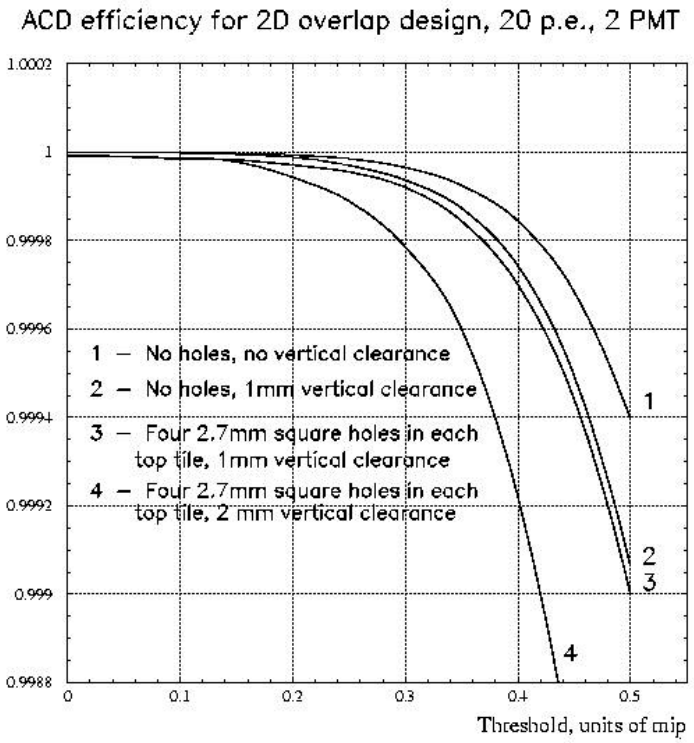
A. Moiseev 05/03/01

Tiles overlap in both directions



- **Tiles overlapped by 1 cm in both directions**
- **Vertical clearance between tiles is allowed for the tile wrapping and mechanical tolerance**

Tiles overlap in both directions (cont.)



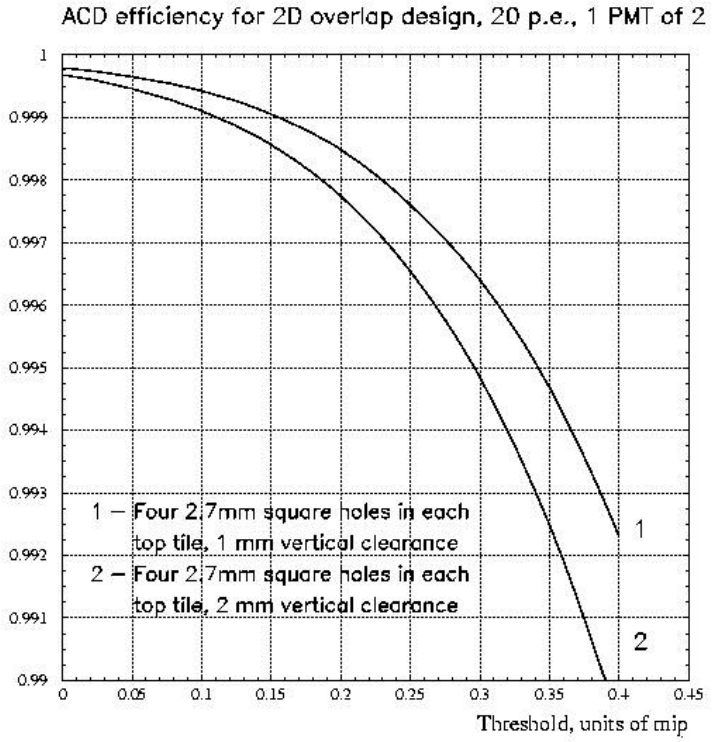
Hole_gap.jpeg

Study of:

- **effect of holes in the tiles (to attach them to the structure). 4 square holes, 2.7 mm by 2.7 mm each are simulated (equal to 3 mm diameter)**
- **effect of vertical clearances between tiles (for wrapping and mechanical tolerance)**

Tiles overlap in both directions (cont.)

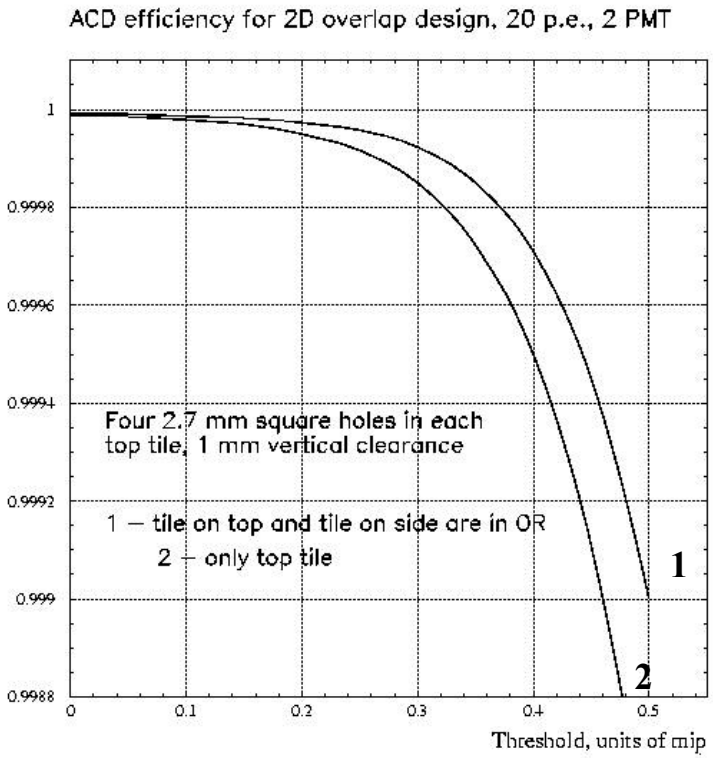
Failure mode



Holes_1tile.jpeg

- **What efficiency will ACD tile have if one PMT dies?**
- **Here is the case for one PMT of two is working (10 p.e. in average), with holes in tiles and two different vertical clearances between tiles**

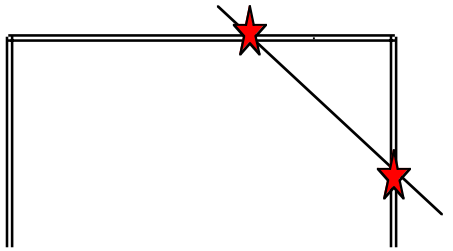
Tiles overlap in both directions (cont.)



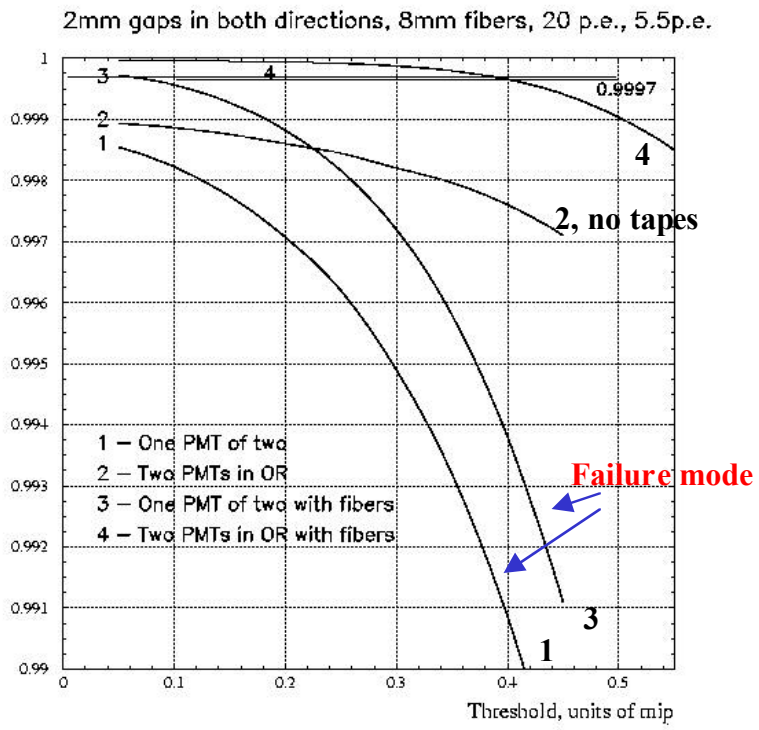
Holes_side_top.jpeg

Two PMT in "OR":

- **Here is an effect of use of side tiles for VETO:**
- **line 1 - VETO is assumed if there was a hit in either tile on the top or in the tile in the side, crossed by the reconstructed trajectory**
- **line 2 - only top tiles are used**



Single plane - gaps between tiles in both directions. covered by fiber tapes

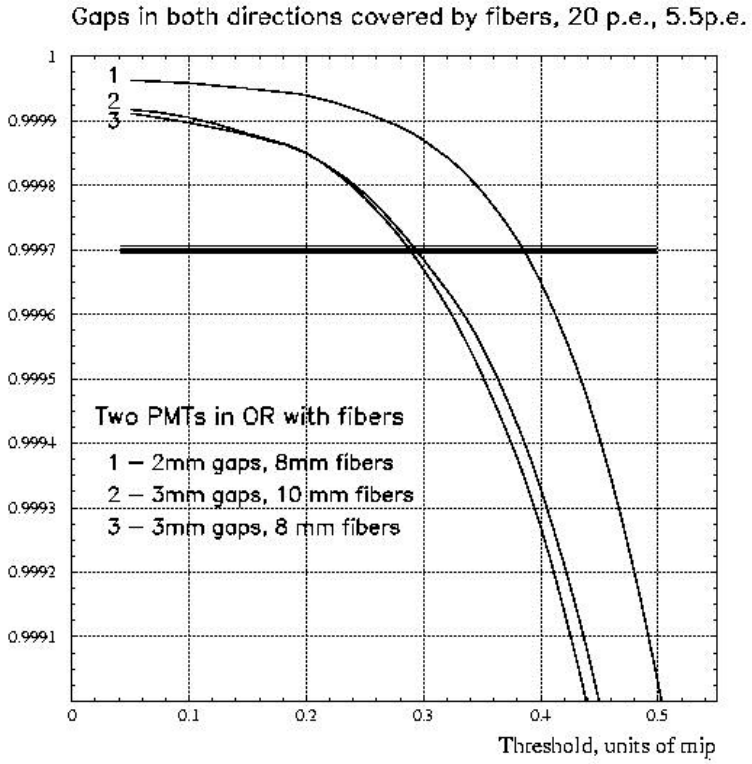


Gap_fiber_2.jpeg

Cases of 1 or 2 operating PMT are presented, with and without use of fiber tapes;

- 20 photoelectrons are assumed from the mip
- 2 mm gaps between tiles in both directions
- 8 mm wide, 2 mm thick rectangular fiber tapes cover the gaps. Vertical clearance between tapes and tiles is 2 mm, between orthogonal tapes layers - 1 mm
- 5.5 photoelectrons are assumed from the fiber tape; threshold is fixed to be 2 p.e.

Single plane - gaps between tiles in both directions, covered by fiber tapes (cont.)



Gap_fiber.jpeg

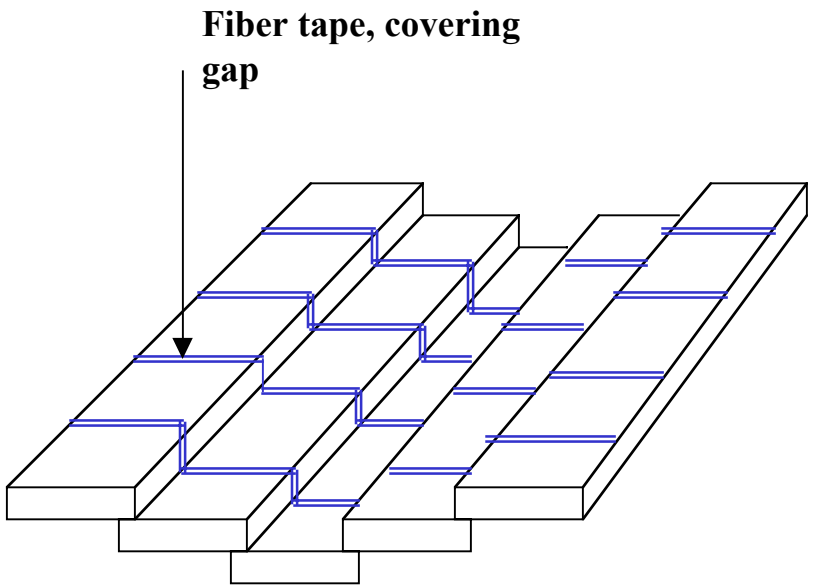
Two PMTs in "OR":

- **2 mm and 3 mm gaps between tiles are compared**
- **8 mm and 10 mm wide tapes are compared**

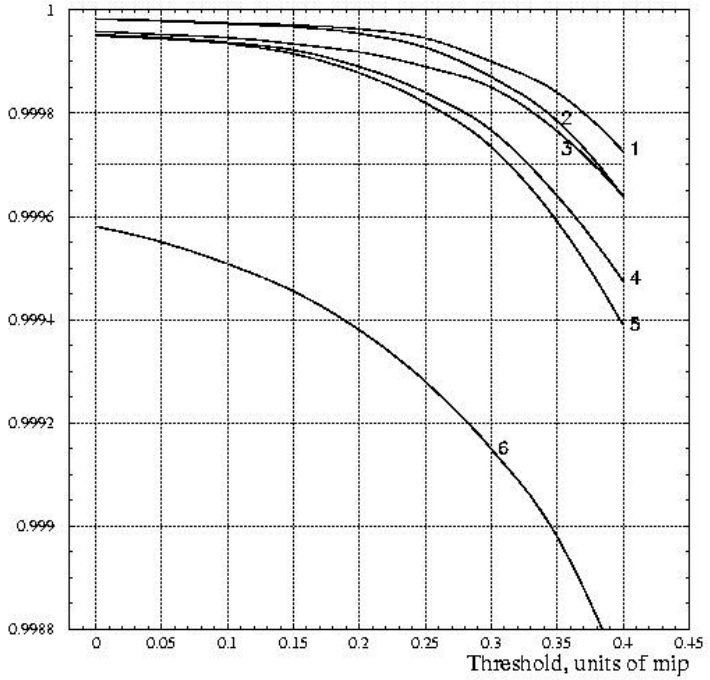
Tile overlaps in one direction with gaps in the other direction covered by fiber tapes (cont.)

Simulated Design.

- all tiles are overlapped by 1cm in one direction, and have the gaps (variable). These gaps are due to the thickness of the tile wrapping (0.7 mm) plus some gaps needed to compensate thermal expansion. These gaps are covered by 2mm thick scintillating fiber.
- the light yield from normal incidence *mip* was assumed to be 5.5 p.e., and the threshold for the detection was set to 2 p.e. Both these numbers are conservative.



Tile overlaps in one direction with gaps in the other direction covered by fiber tapes (cont.)



Gaps_1D.jpeg

- **The following designs were simulated:**

1 - 20 p.e. in average from mip in the tile, 2mm gaps between tiles, 8mm wide fibers

2 - 18 p.e., 2mm gaps, 8mm wide fibers

3 - 20 p.e., 3mm gaps, 8mm wide fibers

4 - 20 p.e., 3mm gaps, 6mm fibers

5 - 18 p.e., 3mm gaps, 6mm fibers

6 - 20 p.e., 2mm gaps, NO fibers